

1.4.6

EE24BTECH11058 - P.Shiny Diavajna

Question: If the point $\mathbf{P}(2, 1)$ lies on the line segment joining points $\mathbf{A}(4, 2)$ and $\mathbf{B}(8, 4)$, then

Solution:

Variable	Description
$\mathbf{P}(2, 1)$	Point on the linesegment joining \mathbf{A} and \mathbf{B}
$\mathbf{A}(4, 2)$	one end of the linesegment AB
$\mathbf{B}(8, 4)$	another end of the linesegment AB

TABLE 0: Variables Used

$$\|A - B\| = \sqrt{(A - B)^\top (A - B)}$$

$$\mathbf{A} = \begin{pmatrix} 4 \\ 2 \end{pmatrix} \mathbf{B} = \begin{pmatrix} 8 \\ 4 \end{pmatrix}$$

$$(A - B) = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$$

$$(A - B)^\top = (-4 - 2)$$

$$\begin{aligned} AB &= \sqrt{(-4 - 2) \begin{pmatrix} -4 \\ -2 \end{pmatrix}} \\ &= 2\sqrt{5} \end{aligned}$$

Similarly,

$$\begin{aligned}
 AP = \|A - P\| &= \sqrt{(-2 - 1)\begin{pmatrix} -2 \\ -1 \end{pmatrix}} \\
 &= \sqrt{5} \\
 PB = \|P - B\| &= \sqrt{(-6 - 3)\begin{pmatrix} -6 \\ -3 \end{pmatrix}} \\
 &= 3\sqrt{5}
 \end{aligned}$$

Therefore,

$$AP = \frac{1}{2}AB$$

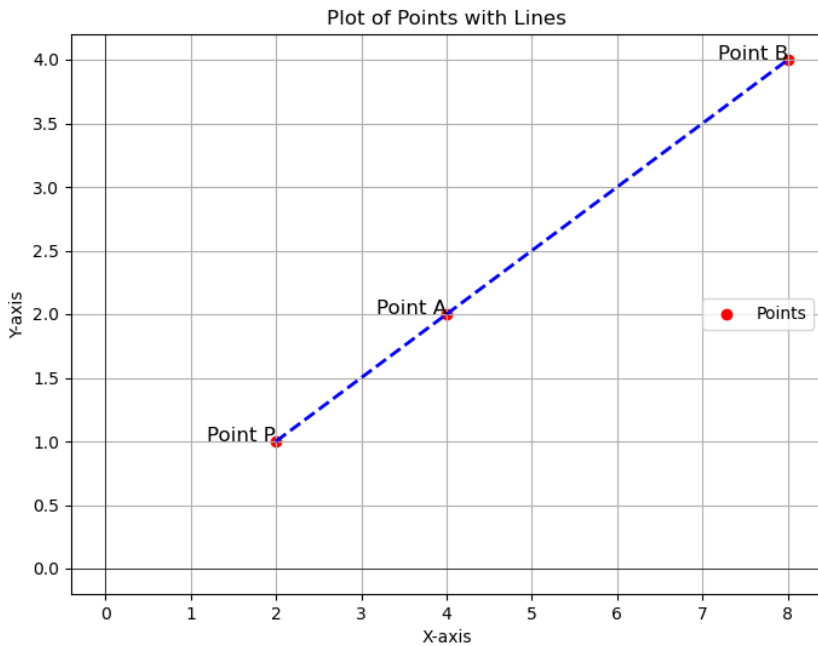


Fig. 0.1: Plot of Points A, B and P